

Oil & Natural Gas Projects

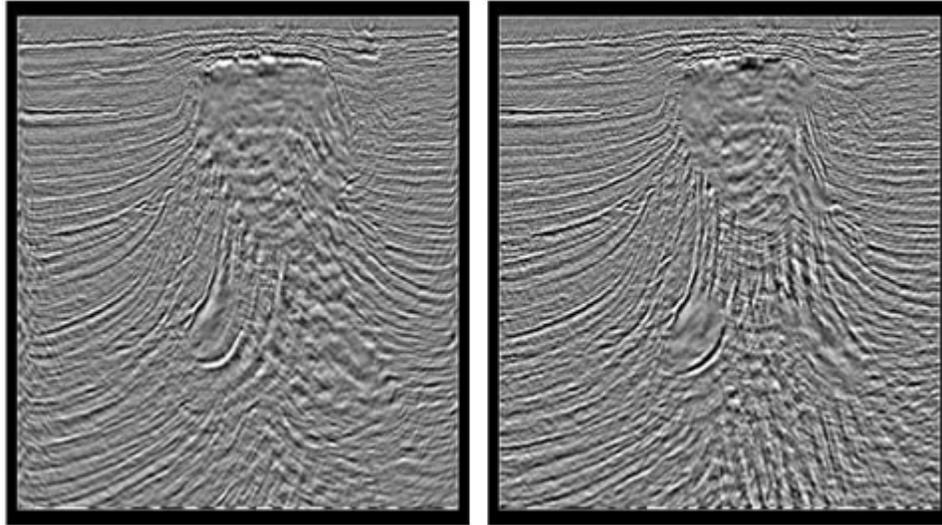
Exploration & Production Technologies

Ultra-Deep Wave-Equation Imaging and Illumination

DE-FC26-04NT42240

Goal:

The purpose of the project is to develop and test a novel technology designed to enhance seismic resolution and image quality using wave-equation depth migration and wave-equation velocity model building.



Comparison between wave equation imaging with 3 km aperture (left) and 10 km aperture (right). Note improved imaging of steeply dipping beds.

Background:

Oil and gas companies use seismic imaging to visualize the shape and complexity of a reservoir prior to drilling a well. The current technologies for depth imaging are the Kirchhoff pre-stack depth migration and the wave-equation depth migration. Wave equation methods are potentially more accurate and robust because they incorporate the full 3-D wave equation rather than being based on 2-D ray theory. The current project develops the ability to image deep gas prospects in onshore and offshore areas of the Gulf coast by using wave equation migration to handle multiple arrivals, and using a wider acquisition aperture (10-15 km) to optimize image quality for depths greater than 15,000 feet.

Performer:

3DGeo

Location:

Houston, Texas 77084
Onshore and offshore Gulf Coast

Potential Impact:

The potential impact of the project will be to allow better imaging of deep onshore and offshore plays that contain large volumes of undiscovered oil and gas. The Mineral Management Service (MMS) estimates that there are 193 Tcf of undiscovered, conventionally recoverable natural gas in the deeper sediments of the Gulf of Mexico. This technology will enhance industry's ability to locate and develop this resource.

Accomplishments:

During the first year of the project, the project team designed a benchmark to test the theory and test the true amplitude migration on synthetic and real data.

Current Status and Remaining Tasks:

A kick-off meeting was held in November, 2004, and the project is proceeding through the following tasks:

- Testing the ability to image true amplitude in wave-equation migration;
- Implement alternative wave-equation amplitude imaging conditions;
- Develop amplitude compensation for irregular illumination ;
- Demonstrate imaging and accuracy on ultra-deep data;
- Investigate effect of aperture on ultra-deep data; and
- Compare wave-equation imaging results with industry standard.

Project Start: October 1, 2004

Project End: September 30, 2006

DOE Contribution: \$504,944

Performer Contribution: \$130,236

Contact Information:

NETL – Frances Toro (frances.toro@netl.doe.gov or 304-285-4107)

3DGeo – Alexander Mihai Popovici (mihai@3Dgeo.com or 281-579-9712 x103)